



# LRMI

Learning Resource  
Metadata Initiative

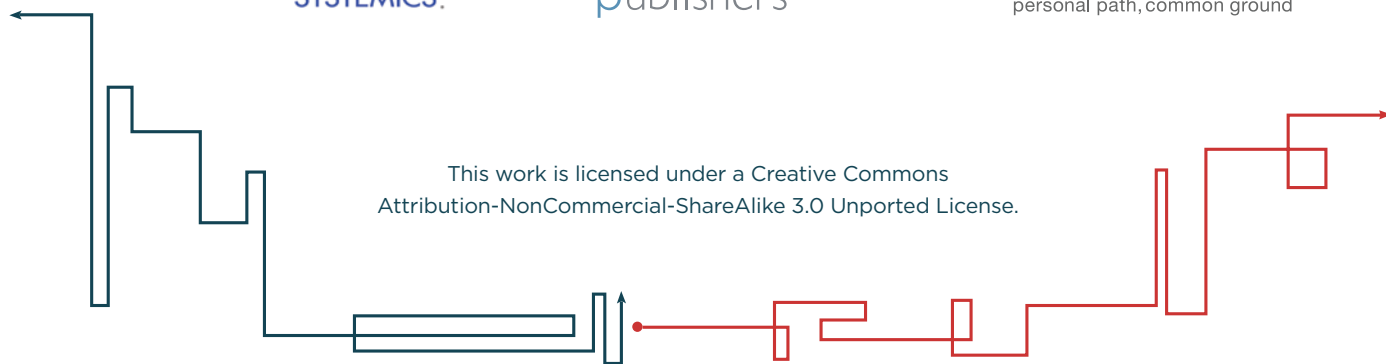
## The Content Developer's Guide to the Learning Resource Metadata Initiative and Learning Registry

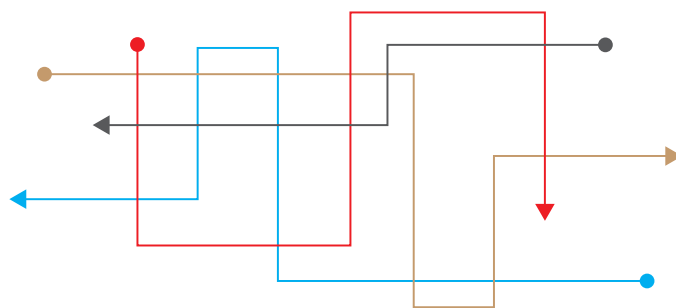
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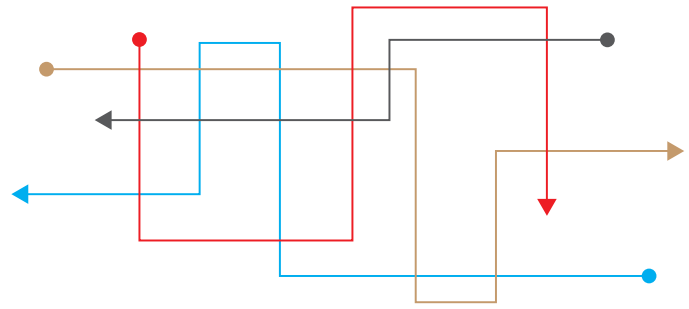
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For more detailed information about LRMI tagging, please refer to  
*The Smart Publisher's Guide to LRMI Tagging.*



## Executive Summary

By Dave Gladney

LRMI Project Manager, The Association of Educational Publishers

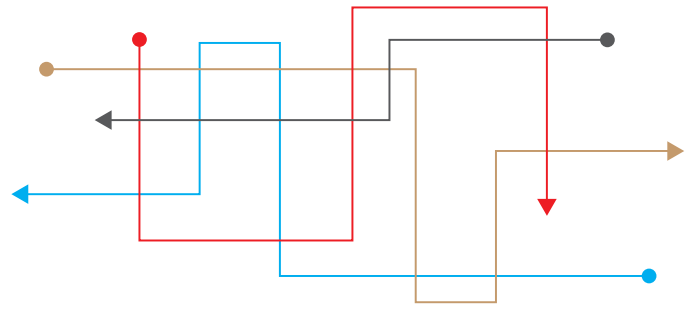
In recent years, there has been a dramatic change in the ways that educators seek and find learning resources. Searches that used to be conducted in libraries now take seconds on the Internet. A recent survey found nearly three in four educators conduct online searches for educational materials at least several times a week. Still, survey participants noted that although Internet searches are speedy, they are not always efficient. Educators complained that there were “too many irrelevant results” and that the process of sifting through thousands—or millions—of potential resources to find the ones that met their specific needs was “too time consuming.”

The survey on educators and search was one of two conducted by the Learning Resource Metadata Initiative (LRMI) in spring 2012—the other focused on publishers and curators of educational content. From these, two main points emerged: 1) Educators are frustrated in their efforts to find learning resources through online searches, and they want a way to efficiently find materials that will meet the specific needs of their students; and 2) Publishers want increased online “discoverability” for their materials; the vast majority believe online visibility is crucial for their sales and marketing programs.

Through the use of metadata and paradata (a specialized type of metadata that can be used to describe how a resource has been used, when, and by whom), the LRMI and the Learning Registry hold the promise for answering these needs and many more. Initiatives such as inBloom (formerly the Shared Learning Collaborative) work to use “big data” to identify students’ strengths and weaknesses, while the LRMI and Learning Registry offer ways to help pinpoint the right learning resources to address their needs.

Still, some educational publishers and content curators remain unfamiliar with the LRMI and the Learning Registry. Others know about the initiatives but aren’t quite sure why or how they should get involved.

This guide aims to provide an overview of the ways that metadata and paradata are changing the educational landscape, with a specific emphasis on why—and how—to effectively implement the LRMI and the Learning Registry. New technologies and new ways of doing things can be intimidating. This guide aims to increase readers’ familiarity with these key initiatives and reduce any anxiety they may have about participating. The guide will help break down the complex pieces that intersect all of the initiatives and bring clarity to their respective missions.



## Foreword

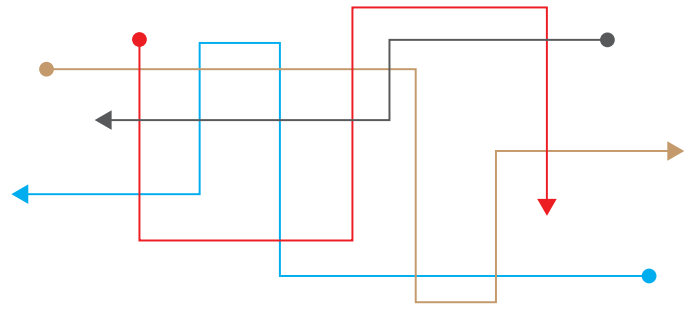
By Michael Jay  
President, Educational Systemics

Quality instructional resources are an essential component of effective learning and teaching. Prior to the early 1980s these resources were either given to educators as part of their general instructional materials and typically tied to a textbook, or they were part of an alternative or supplemental curriculum that provided resources beyond core curricular materials. At that time, except for occasional professional development activities, most educators were isolated in their practice and resulting learner performance.

Today's learning environments are very different places. No longer do educators have to work in isolation, relying on the instructional resources that are given to them. Now, educators routinely share information and ideas in both physical and virtual communities. At the same time, the Internet makes it increasingly easy for educators to seek their own resources to support student learning. Some of these resources are developed by the educators who use them; others are created for distribution through commercial, Open Educational Resources (OER), or other channels. The effectiveness of these resources lies not only in what content they address but also in the context and instructional strategies they employ to engage the learner.

While the Internet makes searching for learning resources easy, the sheer vastness of materials available makes it extremely challenging to find just the right learning resources to address specific student needs. Applying metadata tags to educational materials to make them more easily discoverable through online searching attempts to address this issue.

Most metadata specifications have their roots in the library sciences. The descriptors defined in the Learning Resource Metadata Initiative (LRMI) build on that history and add the hooks that allow educators to look for resources not only by their physical attributes but also by their pedagogical relevance and instructional strategies. By providing educators with the ability to find resources by how the learner will be engaged, we take a giant leap toward being able to support differentiated strategies, individualized learning, and even providing students with greater autonomy with data about their needs and the guidance of an informed educator. As you read this guide, we hope you will keep in mind the promise of this new standard and the benefits it brings to you, your organization, educators, and learners to improve the quality and effectiveness of learning and teaching.



## Introduction

By Brandt Redd

Senior Technology Officer, Bill & Melinda Gates Foundation

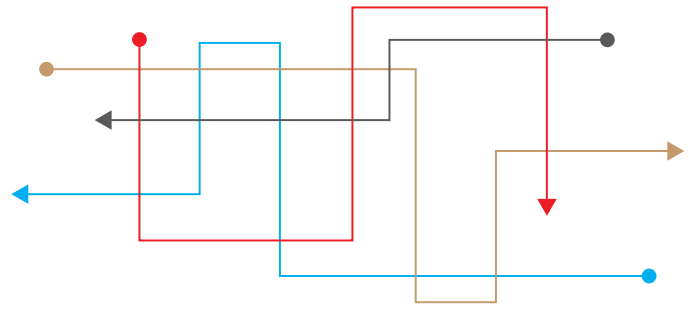
The Learning Resource Metadata Initiative (LRMI) originated with a desire to help students and teachers quickly find relevant educational content. In considering the problem, we realized that the web doesn't need another content repository—it needs a better way to describe content within existing repositories.

The advent of Schema.org, in June of 2011, was a good fit for moving this idea forward. This consortium of major search engines Bing, Google, and Yahoo! (later joined by Yandex) announced they would collaborate on creating a framework and guidelines for using metadata to make search more effective. To complement this effort, the Bill & Melinda Gates Foundation brought together the Association of Educational Publishers and Creative Commons to co-lead the LRMI, an effort to create an education-specific extension for Schema.org. The William and Flora Hewlett Foundation co-funded the project.

Schema.org already defines the metadata schema for basic information about material on the Web, such as a "Creative Work" in the form of a "Book," which has metadata like author, publisher, datePublished, etc. It also defines specific metadata for types like Article, ImageObject, AudioObject, VideoObject, and so forth. So the task of the LRMI Technical Working Group was to augment this with education-specific properties. Group members studied existing educational metadata frameworks and collected use cases. They identified three main areas of emphasis—Learning Objectives, Audience, and Intended Use—and, from these, nine LRMI properties emerged.

It's a complex problem to model taxonomies of learning objectives, and this has complicated previous educational metadata efforts. In the LRMI this is avoided by supporting formal taxonomies such as the Common Core State Standards with unique identifiers (URIs and URLs) if they already exist and enabling the association of a skills statement as free text as well. Thus, the LRMI references taxonomies and captures their semantic content; it neither attempts to encode them nor enforce them. It's also useful to reference taxonomies made up of things other than learning objectives. For instance, grade levels make up taxonomies, which differ among countries. Text complexity, reading level, and educational subject are other taxonomies. The LRMI generalizes this with the educationalAlignment property, which describes the relationship between a learning resource and categories within any taxonomy.

Audience includes factors like age and the aforementioned grade level, but another key audience factor is accessibility to those with disabilities. Unfortunately, this proved too complex a problem for LRMI 1.0. Under a grant from the Gates Foundation, Benetech is presently working on enhancements to LRMI and Schema.org to indicate the accessibility of all Internet content, whether educationally oriented or not.

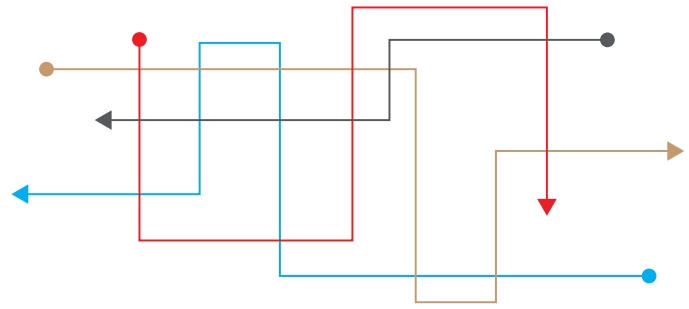


The Learning Registry—an open source technical system designed to facilitate the exchange of information about learning resources—was initiated independently from the LRMI, but the two projects have proven to be synergistic. The Learning Registry offers a way to share metadata between applications and organizations, and a specification has been developed for using the LRMI (and the balance of the Schema.org vocabulary) within it. The Learning Registry originated as a collaboration between the U.S. Department of Education and the Department of Defense. The team carefully designed it as an open, decentralized system so that it can operate independently of continued government support.

As a peer-sharing protocol, the Learning Registry has some advantages over the HTML markup used by Schema.org. Among these are active notifications and third-party assertions. Applications can be notified when new metadata arrives, and metadata statements can be made by entities other than the publisher of the content. For example, teachers can review learning resources and comment on how they use them in classroom settings, and the registry also is designed to capture information such as how often resources have been aligned with specific Common Core State Standards. This type of observed information, also called paradata, can be extremely useful to educators interested in using a particular resource.

The LRMI and the Learning Registry are infrastructure technologies. Applications must be built on these infrastructures to expose them to students and teachers. inBloom is creating a set of shared technology services to facilitate personalized learning for all U.S. students. As part of this effort, inBloom is deploying an instance of the Learning Registry and collecting LRMI metadata and encouraging application developers to use them in developing student and teacher-facing applications.

These initiatives gain power only as people actively use them. This guide provides an overview and a rationale for why those who publish or disseminate educational content should embrace these initiatives. Understanding and acceptance among the entire education community is paramount as we work toward the goal of using “big data” to identify areas of student need and locate appropriate learning resources to provide personalized learning opportunities to every student.

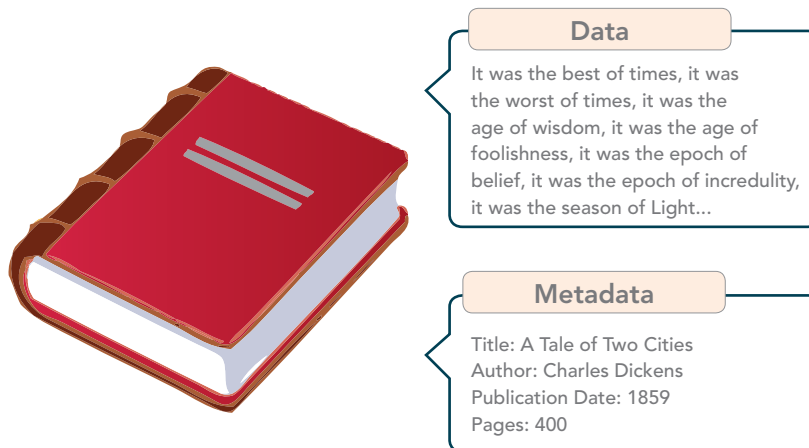


## Metadata Backgrounder

First of all, exactly what is metadata? The National Information Standards Organization (NISO) defines the term this way:

Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource.

Put simply, metadata is the information you use to describe something. Consider the example below. For a book, this would include the title, author, publication date, pages, etc. In the case of learning resources, metadata can and does define the education context, purpose, target audience, the competencies at issue, and other classifying criteria that are not normally part of the content itself.

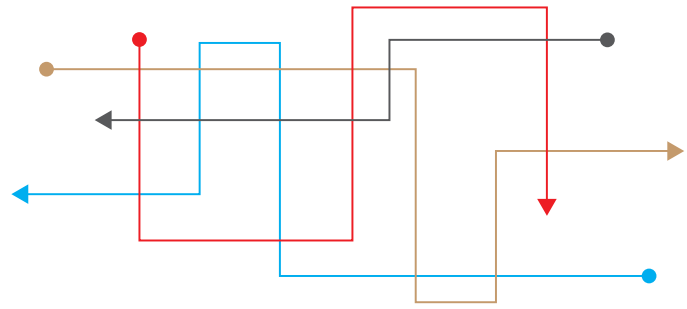


In curriculum development and delivery, metadata has a variety of important uses. Here are four examples of use cases for learning resource metadata:

1. **Discovery**—enabling any user to find resources to meet specific needs
2. **Curriculum development, sequencing, and mapping**
3. **Standards alignment and coverage**—ensuring that all of the standards and their elements are addressed and describing the ways in which specific resources address defined skills and competencies
4. **Evaluation of resources**—assessing what kinds of resources are effective in a variety of contexts and how different resources compare using defined rubrics and review processes

The notion of applying metadata tags to learning resources has been around for some time, as is evidenced by the history of the library sciences and classification and organization schemes such as the Dewey Decimal System and the cross-referenced card catalog index. In the digital domain, however, a





lack of a commonly adopted vocabulary, proprietary content management systems, and limited funding have prevented existing tagging projects from gaining universal acceptance.

The two best-known initiatives in this area are the IEEE LTSC (Learning Technologies Standards Committee), which created the Learning Object Metadata (LOM) specification, and the Dublin Core Metadata Initiative (DCMI), which created the Dublin Core Metadata Element Set (DCMES).

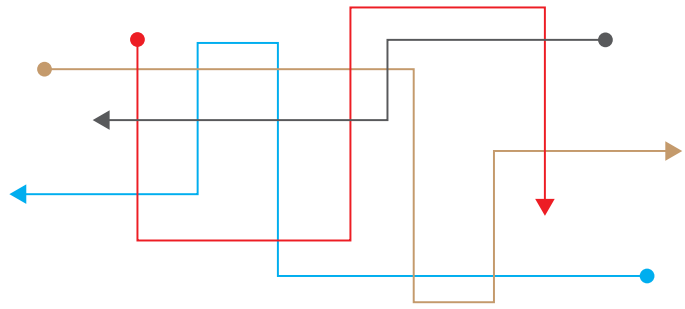
The LOM, an open, two-part standard for the description of “learning objects,” is composed of a conceptual data schema and an XML binding of that schema. Its origins date back to the mid 1990s. Partly because of its status as an international standard, the LOM has enjoyed widespread use among many repositories and learning resource providers.

The DCMES grew out of a 1995 meeting held in Dublin, Ohio, among a global group of metadata experts that coalesced into what is now known as the Dublin Core Metadata Initiative (DCMI). The DCMI developed metadata standards for the description of a broad range of resource types. Its core Element Set (DCMES) has been standardized as ISO 15836 and is comprised of 15 elements: contributor, coverage, creator, date, description, format, identifier, language, publisher, relation, rights, source, subject, title, and type. Additional elements—including a number designed for describing learning resources, have been added. The DCMES is a frequently used metadata standard and is often used in Semantic Web/Linked Data implementations.

In addition to LOM and DCMI, here are examples of organizations or initiatives that employ resource metadata:

1. **Ohio Resource Center**—Not surprisingly, the ORC uses the Dublin Core metadata specification (developed in Dublin, Ohio) to tag a rich set of instructional resources in the four core curriculum areas.
2. **Achievement Standards Network (ASN)** — Created by JES & Co., a U.S. nonprofit, the ASN is a framework for describing competencies and learning outcomes using Resource Description Framework (RDF). ASN data is intended for use with any metadata schema that needs to include competency statements data. The framework is made up of two fundamental entities: (1) standards documents, and (2) standards statements. Under NSF funding, JES & Co. also created a U.S. repository of academic standards based on the ASN framework called the ASN-US, including state and organizational standards. In the ASN framework, each property is identified with a Uniform Resource Identifier (URI) that returns metadata describing the standard to humans and computer applications. JES & Co. maintains an open network of organizations around the world that share and develop the tools based on it. For example, Australia has used the ASN framework in expressing its national standards as RFD data (ASN:AU).



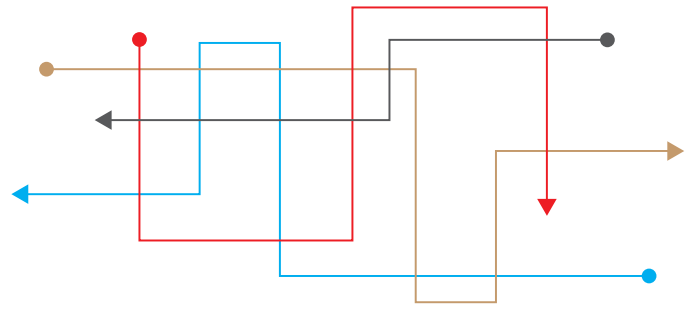


3. **netTrekker Search (by Knovation, Inc.)** — This is a commercial service that tags, indexes, and rates web resources and aligns them to state, local, and national standards, providing a K-12-specific search for teachers and students. It uses similar academic standards data to ASN's but provided by the vendor, Academic Benchmarks, which hosts a service that utilizes a common master skill list to connect taxonomies (state standards) to each other to increase the accessibility of education resources and standards relevant to user needs.
4. **Curriki** — This U.S. nonprofit is dedicated to the creation of a global shared repository for quality Open Educational Resources (OERs), free to use and adapt. The free collaboration, curriculum development, and management services available at [www.curriki.org](http://www.curriki.org) enable teachers, schools, districts, and states to assemble and curate custom collections of the best OER materials, in all formats. The powerful search tools enable discovery of content by subject, educational level, instructional use, target audience, resource type, media type, license, contributor, ratings, reviews, and alignment to any standard, including the Common Core State Standards.

Within publisher organizations, the content production workflow is changing as digital assets are created so that they can be reused. Managing these assets in a Content Management System (CMS) requires thoughtful design around the metadata that is used to describe that content. While curriculum resource development in most cases still starts with the curriculum standards, capturing the instructional intent in a format that supports discoverability and thoughtful repurposing is becoming increasingly important. Most publishers are implementing such systems and draw on the rich history of content metadata as the basis for their tagging. Subtle, and not-so-subtle, differences between these systems often make them incompatible with resources from other publishers. This incompatibility is a huge barrier from the perspective of educators and learners in search of just the right content at just the right time. To enable the sharing of learning resource metadata across different systems, we need to replicate and extend the best practices of all the metadata movements listed here.

In June 2011, major search engines Bing, Google, and Yahoo! (later joined by Yandex) formed Schema.org to create a standard method of tagging webpages across the Internet with descriptive and semantic metadata, sometimes called microdata. The goal is to create a standardized schema for webmasters to use for markup to ensure the maximum benefit for their efforts and to aid users who utilize these tags in online search queries.

Recognizing the Schema.org effort as a prime opportunity to improve online search for instructional materials and lay important groundwork for personalized learning, the Bill & Melinda Gates Foundation invited the Association of Educational Publishers (AEP) and Creative Commons (CC) to spearhead the initiative to create an education-specific extension. The LRMI represents the interests of the education community—both those who produce and curate learning resources, and those who search for them.



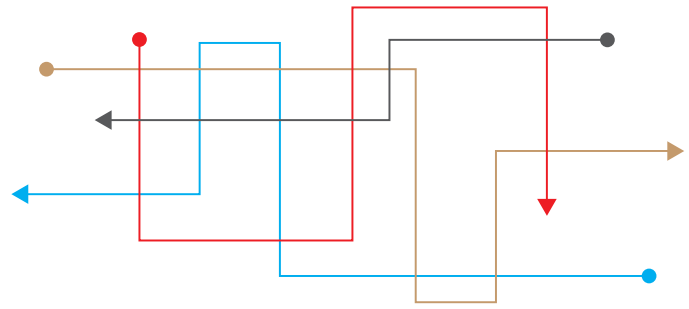
This effort to create a standard system for tagging learning resources online dovetails nicely with other standards-related movements and initiatives. In the U.S., the most recent and highest profile of these is the Common Core State Standards (CCSS), the state-led effort to provide a clear and consistent framework to prepare students for college and the workforce.

The Common Core standards establish specific indicators for student achievement across grade levels and subject areas. Assessment of how well students meet these standards has been funded by Race to the Top Assessment federal funds, in addition to support from the National Governors Association and the Council of Chief State School Officers. Meanwhile, the growing use of big data, which provides rich assessment information about students' specific strengths and needs, offers opportunities for providing data required to support personalized learning. Big data at the state level received a real boost from the Race to the Top funds awarded to many states to, in part, build robust data infrastructures.

Taking advantage of these opportunities, however, requires locating just the right learning resources to address students' needs. That's where the LRMI, combined with the CCSS, comes in. One of the education-specific properties provided by the LRMI is alignment to standards. This means that publishers can indicate how a particular learning resource aligns to specific standards in a common and canonical way. In order for this to work within the framework of the LRMI, each individual standard must have its own unique identifier, as in the case of the Common Core standards.

Implementation can be accomplished in the following four ways:

1. Have or create the metadata.
2. Map the metadata to the LRMI tag elements in a meaningful and consistent way (as defined by this guide and the LRMI Technical Working Group).
3. Use vocabulary that is common with everyone else's, such as the Common Core, plus additional terms from LOM and Dublin Core. Since getting all creators and publishers to utilize the same descriptive terminology for all LRMI tags may be difficult, it should be noted that, even if the vocabulary is not entirely constant, search tools will likely be able to identify similarities in meaning and content.
4. Employ a community review and evaluation process to socialize a common understanding of the terms and standards and their consistent and appropriate use.



One of the strengths of the LRMI specification is that its `educationalAlignment` element can adapt to any taxonomy, standards-based or otherwise. This means, for instance, that it can include alignment to state standards and to international standards.

Meanwhile, educators accessing materials through the Learning Registry can also indicate how a particular resource aligns with a specific Common Core standard or state standard. This usage data (paradata) then further informs other users about what resources best fit the needs of their classroom and students.

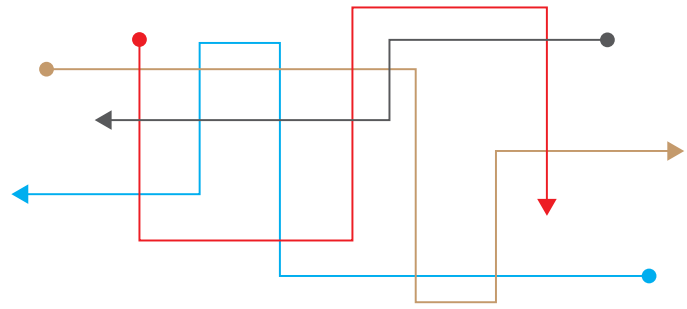
To put this in perspective, the LRMI is a metadata standard for tagging specific attributes, such as `educationalAlignment`, to learning resources. The Learning Registry is a metadata exchange network that enables storage and sharing of LRMI-style metadata, as well as other user assertions about learning resources (paradata). Together, the LRMI and the Learning Registry offer educators a powerful way to find—and then share information about—learning resources.

## Learning Resource Metadata Initiative

The key missions of the Learning Resource Metadata Initiative (LRMI) are relatively straightforward—to create a standard metadata framework for tagging learning resources online and to encourage adoption of this framework among the educational resource community. When a critical mass of educational content is tagged in a consistent manner, filtering this content will become substantially easier, allowing search engines and other delivery platforms to deliver the exact resources educators and students need at the precise moment they need them. The initiative aims to create an education-specific extension of Schema.org’s effort to establish a standard method of tagging webpages across the Internet.

During Phase I, a Technical Working Group of education metadata experts developed a specification for educational materials designed to be representative of the needs of all stakeholders in markup for search and discovery. The LRMI was developed with sensitivity to the fact that many useful (and highly used) existing collections of learning resources have relied over the years on the DCMES or LOM specifications. The continuing value of these previous investments is evident in the fact that the aspects of the DCMES and LOM relevant to markup for discovery can be mapped to LRMI terms.

The resulting LRMI specification proposed the addition of nine properties to the Schema.org framework: `educationalRole`, `educationalAlignment`, `educationalUse`, `timeRequired`, `typicalAgeRange`, `interactivityType`, `learningResourceType`, `useRightsUrl`, and `isBasedOnUrl`. For a detailed look at the specification, including brief descriptions of each property, see Appendix B.



During Phase II of the initiative, the focus shifted to implementation. While the specification awaited official adoption from Schema.org, more than a dozen publishers and content curators came on board to take part in a Proof of Concept phase. This involved tagging hundreds of resources in order to test the process and to begin developing best practices around tagging.

Meanwhile, in the spring of 2012 the LRMI conducted surveys of both educators and publishers to determine their frustrations and needs surrounding Internet search for learning resources. Not surprisingly, educators focused on the challenges involved in trying to find resources to meet the specific needs of their students from among the millions of hits generated by generic Internet searches. Publishers, on the other hand, hoped the LRMI would lead to improved “discoverability” of their materials. Download the [LRMI Survey Report: July 2012](#).

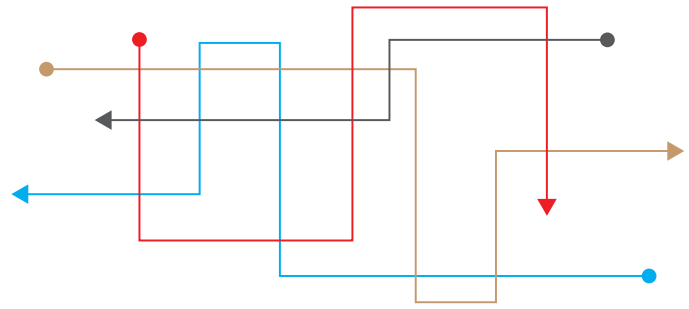
In October 2012, the LRMI conducted an Easy Access and Search for Education (EASE) campaign to encourage educators to speak out about what was needed to improve the search process. Nearly 100 educators responded, and their comments echoed the results of the previous educator survey. They called for better ways to filter online searches for learning resources according to categories such as content area, age range, standards alignment, and media type. Download the [EASE Summary Report and Infographic](#).

The survey and EASE campaign represent just two of the LRMI’s efforts to raise awareness among publishers and content curators of the importance of the LRMI to their businesses. LRMI leaders also have established a website and blog at [www.lrmi.net](http://www.lrmi.net), placed articles in key educational outlets, organized workshops and webinars, and made contacts at conferences.

Part of the LRMI’s continued outreach involves raising awareness about the project among learning resource providers throughout the world. The LRMI is an open and global standard and as such is available for use and adaptation by educational agencies and publishers worldwide. The properties included are intentionally culture-agnostic. This allows, for example, alignment to any curriculum standard, regardless of its country of origin.

Already during the first year of active tagging of resources, discussions have begun with associations representing publishers in several different geographies. We invite you to encourage use and adoption wherever you or your customers reside.

Moving forward, the LRMI can play a major role in the effort to make personalized instruction possible for students. The LRMI allows us to connect the right learner with the right content at the right time—whether through a search engine or another sort of delivery platform.



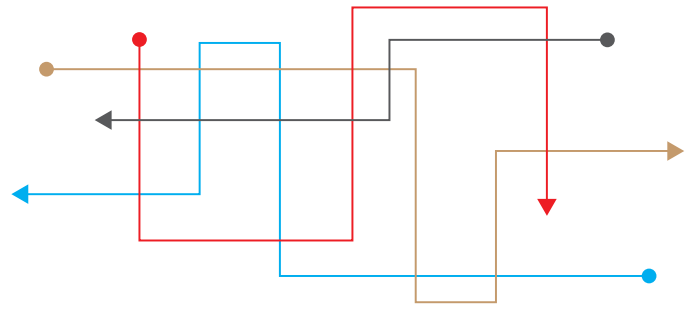
## What Is LRMI Not?

Those involved with the LRMI are often asked very practical questions such as, “Can I search LRMI to find resources to address a specific curriculum standard?” or “Can I use the LRMI to determine where there are gaps in my curriculum offering?” This touches on a common misconception that the LRMI is a thing with which people can interact to answer questions about their instructional resources.

The LRMI should be treated as an extension of the Schema.org language that describes properties of instructional resources—and nothing more. While some working with LRMI tagging have developed recommended sets of vocabulary, there is no prescribed set of terms to be used within in the LRMI framework, and those in use will surely evolve.

The LRMI relies on applications that utilize that vocabulary, while being available for anyone to use where they see a need. Examples of such applications are the Learning Registry and tools developed as part of inBloom, including Tagger and Search. Your organization may have tools that you would like to develop for both internal and external use that employ the LRMI. The LRMI serves as the common language your applications can use to communicate instructional intent, needs, standards alignment, and other attributes that describe how the learner engages and interacts with the resource. By itself, LRMI may not improve learning; however, it is an essential component of the tools that will make it possible to address the needs of every child and educator.

It is also important to note that the LRMI is not a description set for creating metadata records; it is a markup language. While the intentional simplicity of the LRMI makes it inadequate for rich description, this same characteristic makes it a useful and easily implemented convention for tagging content.



## The LRMI in Action

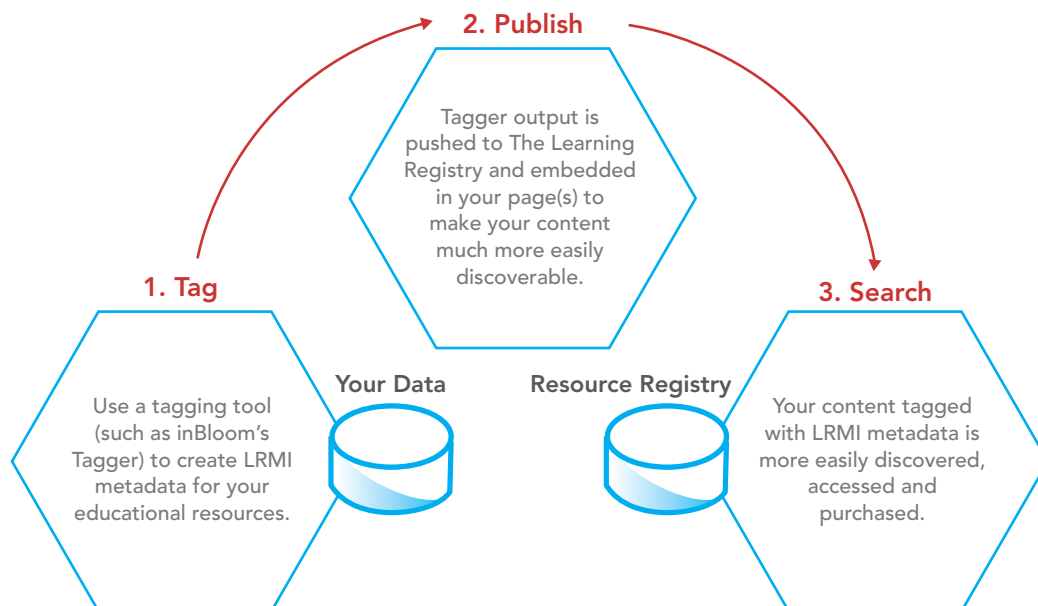
The LRMI Technical Work Group has proposed that nine distinct education-specific properties be added to the Schema.org framework as follows:

1. educationalRole
2. educationalAlignment
3. educationalUse
4. timeRequired
5. typicalAgeRange
6. interactivityType
7. learningResourceType
8. useRightsURL
9. isBasedOnURL

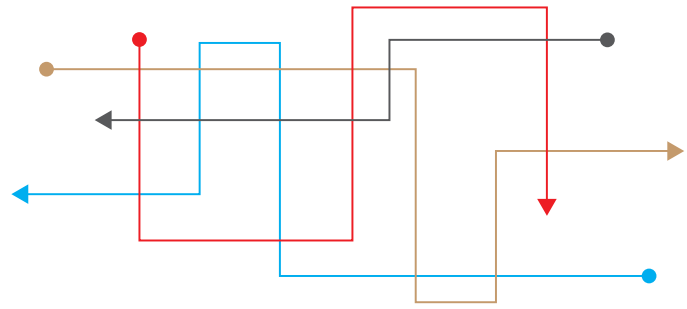
Schema.org adoption of the LRMI markup would make it the de facto standard metadata schema for learning resources.

This shared markup vocabulary will make it easier to use the schema and to improve the display of search results. As more and more learning resources are tagged to the LRMI specification and as search engines add the specification to their crawlers and user interfaces, educators can use the LRMI to pinpoint the exact materials they need at the exact time they need them.

The following diagram illustrates the process for tagging and publishing learning resources using the LRMI specification. That tagged content then becomes easier for people to find when conducting online searches.







How does this work in practice? Consider the Teacher Use examples that follow.

### Teacher Use Example #1

A seventh-grade teacher is trying to help students with the following Common Core Reading Standard for Informational Text 6-12:

Craft and Structure 6 (CCSS.ELA-Literacy.RI.7.6)—Determine an author’s point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.

Say the specific topic under consideration is economic decision making, and the teacher wants to find an article aligned to that particular standard that is supported with comprehension questions and a writing activity. The material should also be appropriate for small-group work and designed to be completed in less than an hour.

A Google search for “economic decision making lesson plans” yields nearly 7 million options. Finding a resource at the right grade level incorporating all of the teacher’s desired requirements that aligns to the specific standard could take an entire planning period, and even then the resource still might not offer everything the teacher wants.

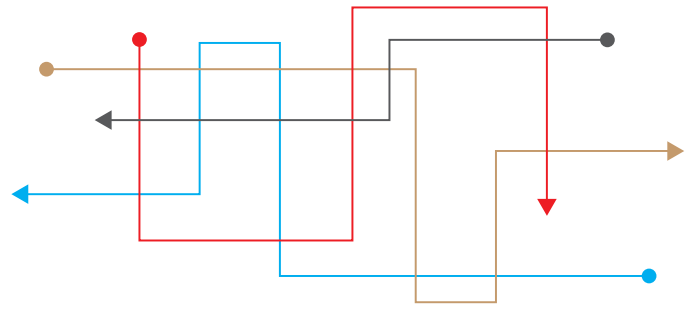
Now consider that same search using the LRMI search properties outlined above. In just a few clicks, the teacher could find a handful of targeted resources meeting the exact specifications required. That’s the potential power of the LRMI.

### Teacher Use Example #2

A fourth-grade teacher seeks resources to help a student who is struggling with the concept of adding fractions. Typing the search term “adding fractions” into Google yields more than 8 million results. These include (on the first page alone) lesson plans, websites, and videos. Sifting through all that content to find just the right resources to meet the student’s specific learning needs presents quite a challenge.

Using assessment data of the sort becoming increasingly available through initiatives such as inBloom, the teacher knows not only that this particular student struggles with adding fractions, but also that he learns best by watching videos and then taking multiple-choice quizzes. So how does the teacher sort through millions of instructional resources relating to the topic of adding fractions and find exactly the right one to help this student?

That’s where the LRMI comes in. The LRMI criteria would allow the teacher to quickly find instructional videos on adding fractions that are appropriate for fourth-grade students and include multiple-choice quizzes. A formerly hit-and-miss process can now be accomplished efficiently in a few mouse clicks.



## Business Workflow and Considerations

According to the results of the survey conducted by the LRMI in the spring of 2012, educational publishers and content curators expressed great concern about the “discoverability” of their materials through Internet searches. Key findings included the following:

- 46.4% said they are either “dissatisfied” or “somewhat dissatisfied” with the current online visibility of their products.
- 57.1% stated that their customers find it “difficult” or “somewhat difficult” to find their content and products when conducting online searches.
- 65% agreed that they would either “definitely implement” or be “highly likely” to implement a new markup schema if discoverability would improve.

These statistics make a compelling case for learning resource providers to adopt the LRMI framework. Still, tagging materials to the LRMI specification does represent an investment in terms of staff time. Here’s what some business leaders say about why they think the initiative is important.

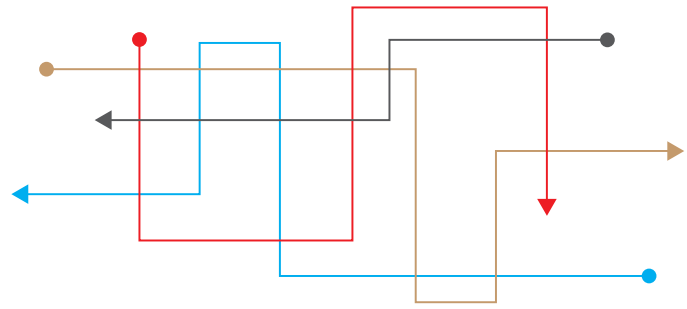
### Lee Wilson, Former President and CEO, PCI Education

PCI Education views the LRMI as an important initiative because it facilitates an effective and relevant search for educational content on the web. Common metadata means that educational content can be viewed through one lens that filters for the most salient features educators are seeking. PCI Education hopes that, through the use of common metadata, educators are able to more easily locate our products and compare them to other products in the marketplace. Ultimately, this will enable us to serve both educators and students better, providing exactly what they need when they need it.

As a participant in the LRMI Proof of Concept, PCI Education is able to be involved in the early work on this critical initiative. Through this work, PCI Education will be able to ensure that materials for students with special needs are represented in the Proof of Concept and, with the pending work being done on accessibility metadata, will eventually be clearly discernible from materials for the general education population. Moving forward, we hope that, as educational metadata standards are honed and implemented, the voice of the publisher of materials for students outside the general educational population is not lost.

### Joshua Marks, CTO, Curriki

Curriki is a resource repository—every folder has a full metadata record, including title, description, subject, topics within subject, grade, instructional use, license, and copyright holder or holders. Tagging to the LRMI specification is easy for us because everything is tagged automatically for inclusion in Curriki. It’s all in our database already.



The main benefit of the LRMI is pure discoverability. You do the tagging so people who are looking for learning resources can more easily find them. In fact, you can see how such filtering works right now when you search for content in the Curriki community in Advanced Search, where you can filter results by subject, topic, level, language, instructional component type, rating, reviews, and all other Curriki-specific metadata. This is what the LRMI will standardize for the entire Web.

There's an assumption that this metadata will enable adaptive learning. The LRMI tagging scheme can enable that, but not without common standards, common vocabularies, and common structures for the materials. In fact, without these standards and the central role that LRMI plays in providing a common way to define the use and target for learning assets, the dream of personalized dynamic learning systems would not be possible.

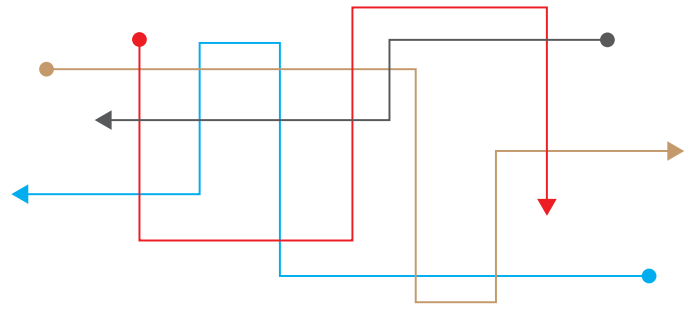
I urge people to ask their content providers to apply the LRMI and to encourage search engines to use the LRMI tags in their crawlers and user interfaces. We need everyone who publishes learning resources to use and support the LRMI, and in a consistent way. We also need all these sources to agree on common terms and vocabularies; this is why LRMI in and of itself is not enough. The Common Core is a great start!

#### **David Grandison, Jr., Executive Producer, BrainPOP**

As the Search Engine Optimization (SEO) evangelist on our team, I felt it was very important for BrainPOP to get involved in the LRMI pilot. My team has been working hard to align our online resources with SEO "best practices" and academic standards. I feel the LRMI project makes use of metadata and microdata to do this on a new level.

The future of the web, what some call Web 3.0, is based on semantic search and algorithms that will help machines make sense of the data on webpages, interrelate it, and ultimately enable more adaptive learning environments for students. So the more material we tag with detailed microdata, the more "findable" our content and educational resources will be for teachers and students. The LRMI project is very much aligned with this future.

Tagging our materials to the LRMI specifications is challenging because many of our resource types are hybrids of things that were specified in the current classifications. We have to decide whether to submit a new classification or use a combination of existing classifications. It's tough, but I believe creating, sharing, and agreeing upon this common "language" of educational classifications will have a big payoff in the future. Companies that start grappling with these issues now will be way ahead when tagging with microdata becomes the norm, and search engines like Google and Bing start to require it.



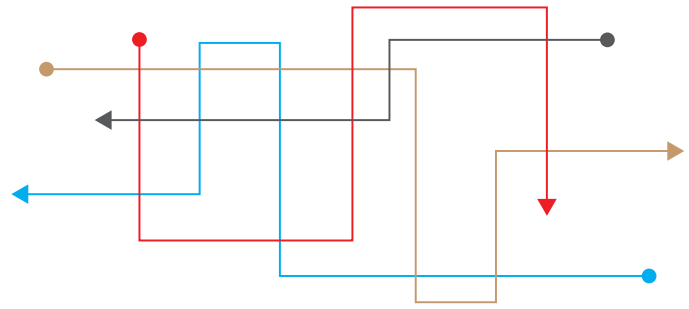
Going through the long and challenging process of advanced tagging can only help a company's website. It involves looking at your content from the perspective of a user's search and providing more details and clearer information that will appear in search results. This will help users make the decision about which educational resource meets their needs. And it helps the user experience, which benefits everyone.

The Holy Grail for instructional technologists is to be able to personalize instruction by delivering resources that will be of the highest interest to students and are most directly aligned to their needs. If we can offer up exactly what teachers are looking for, at exactly the time they need it, we make their jobs much easier. The LRMI is all about making great resources more discoverable and empowering educators, so we're happy to help out.

**Roger Rosen, President, Rosen Publishing**

Rosen Publishing is committed to participating in the LRMI because a streamlined electronic gateway and repository of content systematized by common metadata will provide the ease of access for educational online content that 21st century learning demands. This ease of access benefits all stakeholders within the educational environment: students, teachers, and content providers. The LRMI implementation has the potential to be a game-changer in electronic learning.

At the Association of Educational Publishers' CEO Roundtable in November 2012, which revolved around the theme of "Big Data Leadership Day," I participated in a closing panel discussion of "What Do I Do Tomorrow?" During that session, I noted the importance for companies to include the LRMI as part of their business model for moving forward in the age of big data, pointing out that discoverability is a key to success. If customers can't easily find your products when conducting searches for learning resources online, they won't buy them.



## The Learning Registry: An Overview

One of the benefits of a common set of metadata descriptors is that participating taggers can tag their materials once and enhance their discoverability in multiple ways. For instance, as the work of inBloom moves toward identifying individual student needs and enhanced personalized learning options, the LRMI can help pinpoint appropriate learning resources to meet identified needs. Furthermore, the plan is for materials appearing on the Learning Registry to be tagged according to the LRMI specification, meaning that both commercially produced materials and Open Educational Resources should benefit from improved discoverability when tagged to the LRMI specification.

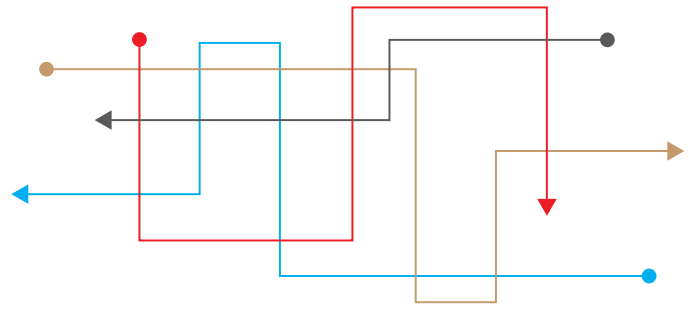
In today's digital world, the Learning Registry facilitates the sharing of learning resources from the classroom to statewide level. Begun as a project funded by the U.S. Department of Education and the U.S. Department of Defense to share learning resources from federal repositories, the Learning Registry has evolved into a mechanism for freeing up data and building ways to connect information from many organizations and user communities.

The Learning Registry is not a website or content repository; rather it's a network that allows multiple users to easily find information about learning resources contributed by other sites. It's a free and open community based on open source and open standards. Through it, educators can access a multitude of resources addressing a wide range of topics and age levels.

As states adopt the Common Core State Standards, the Learning Registry will allow educators to share information about what works in specific situations. For example, one state or district might determine that a particular video or worksheet is useful for teaching a specific math standard. Through the Learning Registry, that state or district can share that alignment relationship, and educators anywhere can take advantage of that information.

The power of such sharing can be demonstrated by a simple example. If only 20 states each aligned just 50 digital resources to Common Core standards and shared that information with other states through the Learning Registry, teachers everywhere would have access to 1,000 standards-aligned resources, all easily accessible through systems they already use. Before, states would have to trade this information privately on an individual basis. Now they can publish the data to the Learning Registry for any interested entity to access and consume anytime, anywhere.

Furthermore, educators will be able to rate and comment on the resources they access through the Learning Registry. The LR network also will keep track of the number of clicks made on various resources. This means that other educators will be able to see how often a resource was accessed, how other educators rated it, and what they said about it.



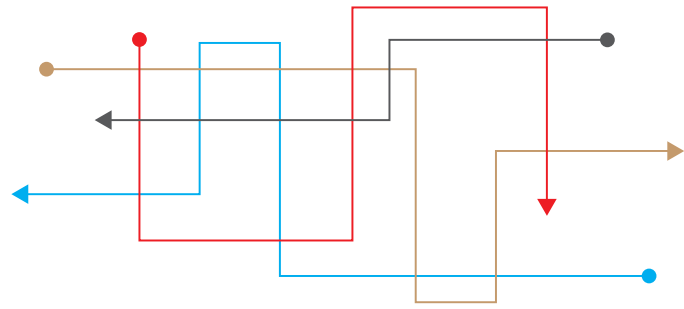
Here are three key benefits of using the Learning Registry:

1. **Expanded access to descriptive data on educational resources.** The Learning Registry provides an easy-to-adopt and easy-to-operate mechanism for disseminating and consuming resource information.
2. **Pooling knowledge about learning resources.** By collecting paradata that specifies not only how often a learning resource is used but also how it has been aligned to specific standards and in what educational contexts it has been used, the Learning Registry holds the promise of helping teachers find the strongest possible resources to meet specific, standards-aligned learning needs.
3. **Providing tools and services to create applications that make use of big data about resources.** Among other functions, the Learning Registry will allow the education community to connect standards alignment across states. For example, by using “cross-walk” data indicating how a particular resource connects both to specific state standards and Common Core standards, states can share resources broadly that have already been aligned with different state standards.

In addition to resources from U.S. Government entities such as Federal Resources for Educational Excellence, the Library of Congress, the National Archives, the National Science Digital Library, and others, the Learning Registry currently contains resources from European Schoolnet, BetterLesson, and PBS LearningMedia. The Learning Registry encourages states and other entities to both publish and consume data from the registry using open interfaces.

For further details about many of the topics outlined, read ***Building a Network of Resource-Sharing States***, from which much of the preceding information is drawn.





## Publishing Your Resources to the Learning Registry

So, how do I get my data onto the Learning Registry? It's a fairly straightforward procedure, but complex enough to prohibit being boiled down into a few hundred words for this document. For an excellent step-by-step walk-through of the process, read [\*Learning Registry in 20 Minutes or Less\*](#).

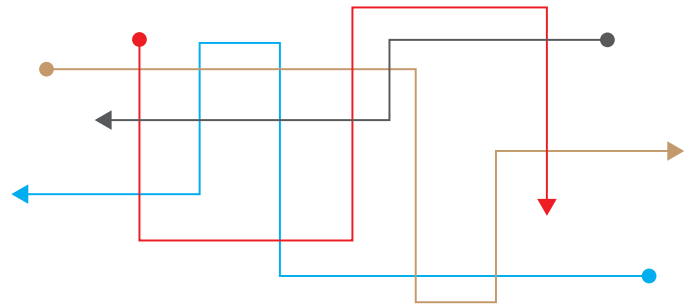
Please note that you will need a basic understanding of Unix because you need to enter specific commands into the shell. You also will need to have Python 2.6.5+ and GPG 2.0.17+ installed and accessible in your path. Once those requirements are met, you can follow the steps outlined in the Learning Registry's guide.

The *Learning Registry in 20 Minutes or Less* offers an excellent overview of the technical aspects of how the Learning Registry's system works. However, your specific needs and resources will help determine exactly how you choose to participate.

In its overall spirit of openness and collaboration, the Learning Registry community offers support to those who are just starting to post resources. Clicking on "Starter Resources" on the home page takes you to a page brimming with information and ideas. Special mailing lists for developers and collaborators allow seasoned participants to share tips and expertise with new members of the community. Weekly developer calls, which are open to the public, and periodic calls about design further promote the exchange of ideas.

What happens once a learning resource is posted to the Learning Registry? Here's one example of how the process has worked, as outlined in *Learning Registry for State Decision Makers and Strategists*:

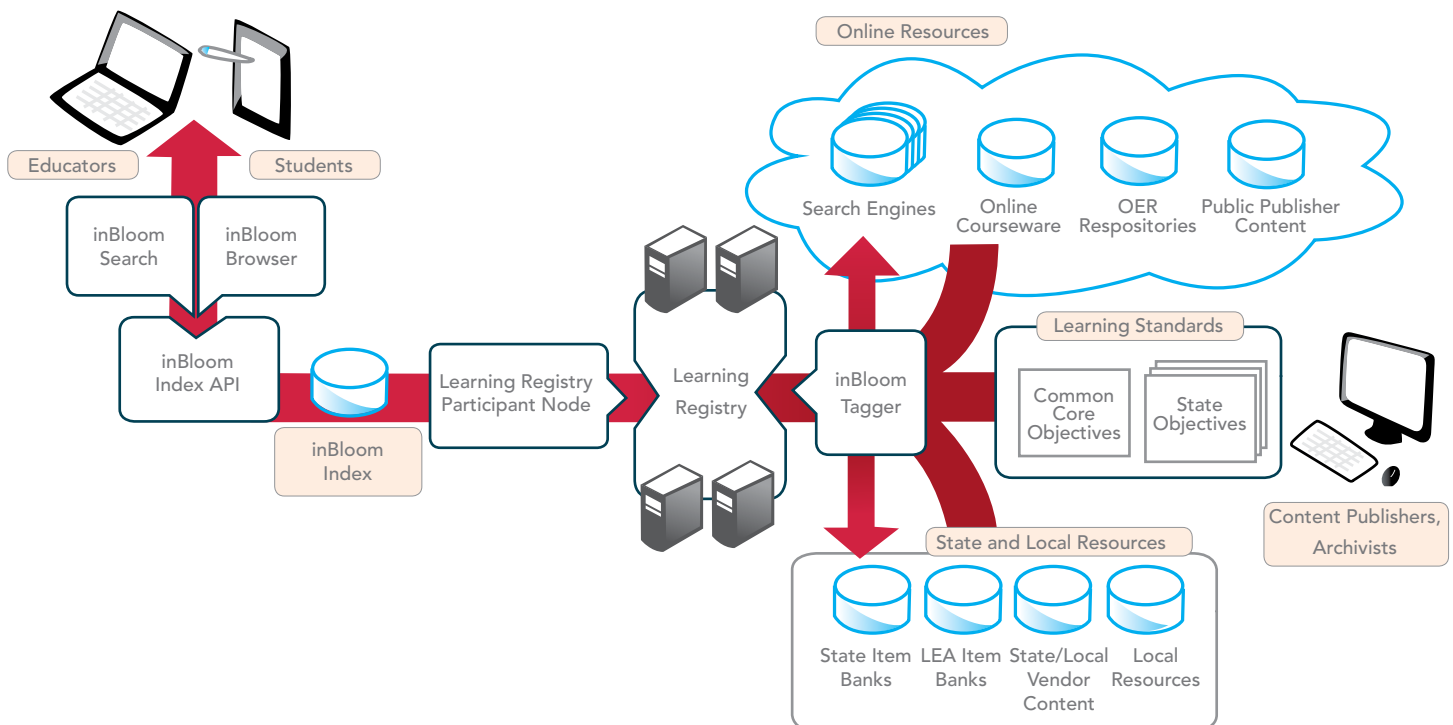
1. PBS LearningMedia publishes metadata about learning resources, including the "Anatomy of a Rover" resource, to their Learning Registry node. This metadata gets replicated to a public Learning Registry node.
2. The Agilix BrainHoney platform consumes the metadata as a NOVA-based collection of PBS LearningMedia resources and makes them available to its users.
3. As part of a grant assessing the quality of open educational resources, an expert using the Agilix platform aligns the resource to a Common Core standard: "Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem." (RST.9-10-8)
4. Paradata about that alignment goes into the Learning Registry, referencing a machine-readable identifier for that standard.
5. CTE Online (California's Center for Career and Technical Education) consumes the paradata and makes use of them based on criteria that have established the identity and trust of the publisher.

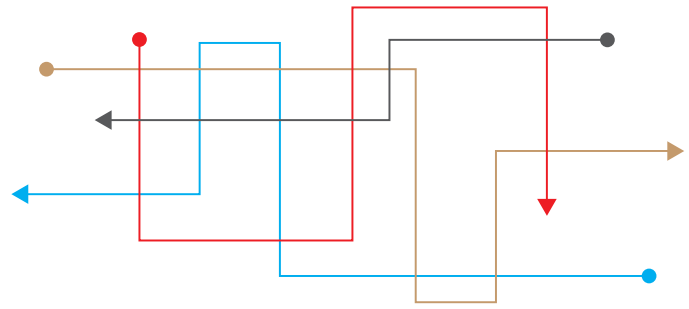


6. A teacher using CTE Online is building a lesson that references this Common Core standard. This lesson is part of the model curriculum, "The 10-Step Engineering Design Solution Process."
7. When looking for resources to use in this lesson, the teacher is presented with suggestions from the Learning Registry based on the standards alignment done on the Agilix platform.
8. When the teacher incorporates the resource into the lesson, that action is captured by CTE Online. CTE Online then publishes a notification of that action as paradata to the Learning Registry.
9. Another teacher portal, Brokers of Expertise, consumes various paradata, including those generated by users of CTE Online, and displays them in a context-appropriate manner to its users.

The diagram below shows an example of how metatagging could be employed to facilitate the search and retrieval of instructional resources. Working from right to left, educational publishers develop instructional materials that are then tagged to learning standards and other metadata, which are stored in the Learning Registry. Working from left to right, educators and students search for educational resources and find exactly what they are looking for. Without a standardized metatagging approach, it would not be possible to easily find the right resources.

It's important to note that the Learning Registry does not provide gatekeeping services. People can share any learning resources that they are willing and able to tag with metadata. However, the registry does provide an identity framework that distinguishes the people who post educational content. This allows individual teachers, states, or publishers to "take credit" for the resources or reviews posted.



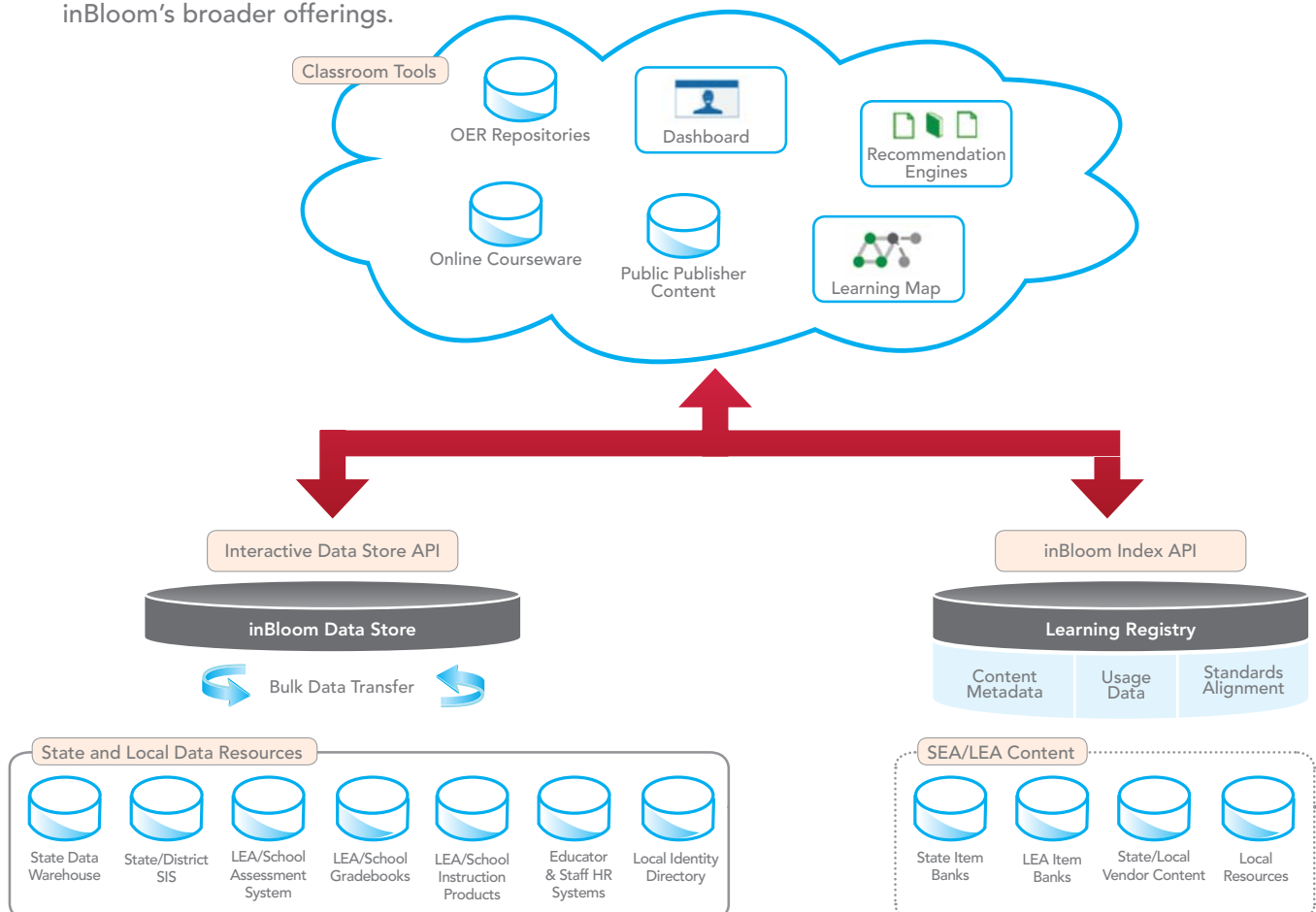


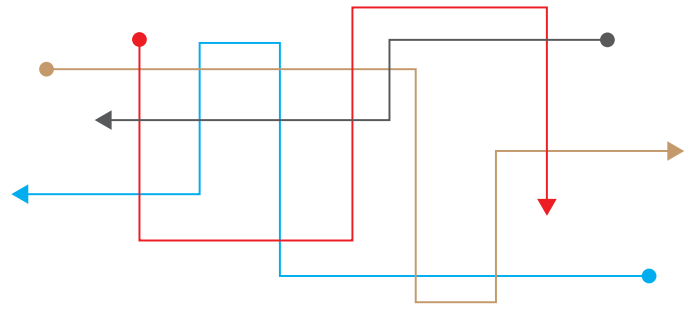
Of course, educational resources are only as trustworthy as the people who post them. With that in mind, services are also being developed for the registry that will enable node operators to automatically categorize incoming data based on the level of trust in the publisher. Meanwhile, learning resource publishers are starting to endorse some of the individual participating users and groups who post comments and reviews. Eventually, the Learning Registry may enable nodes to filter data to show only material from participants who have been endorsed by their publishers.

Another challenge with managing ever-growing oceans of data involves keeping resources up to date. The Learning Registry provides a common framework for publishing assertions about resources, such as updates, replaces, and deletion. The registry is developing services to make these changes transparent to users.

## inBloom Index

The inBloom Index is a technology service being built by inBloom as part of its effort to make personalized learning a reality for every U.S. student by improving the usefulness, variety, and affordability of education technology. The following figure shows how the inBloom Index fits into inBloom's broader offerings.





The inBloom Index establishes a link between applications and learning resources by storing and cataloging resource descriptions and allowing the described resources to be located quickly by the users who seek them. This capability is in large part due to resource alignment with the Common Core and state-specific learning standards, via LRMI metadata.

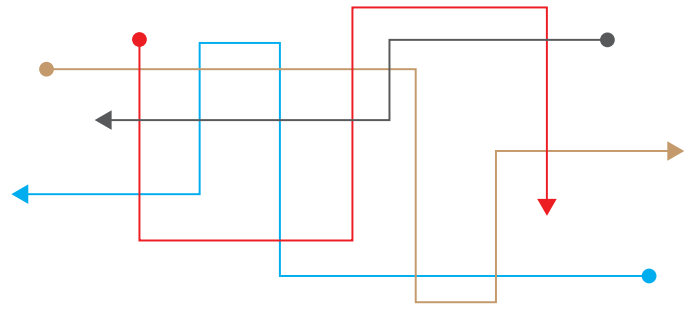
Information about learning resources is obtained from the Learning Registry network, a project supported by public, private, and nonprofit members who participate in various roles as educational content publishers, indexing and search providers, and content consumers. Based on an open framework, the network allows anyone to subscribe to, and make use of, the information flowing through it.

The inBloom Index service receives and catalogs updates from all the publishing nodes and filters out announcements received from the network that are not relevant to educational resources or other educational objects. Content providers and local agencies with their own repositories will be able to announce the location of their learning objects either by establishing their own Learning Registry network node, or just by utilizing the inBloom Index. As nodes are established, inBloom users or applications will then be able to search a wider catalog of accessible material that is more targeted and therefore more relevant to their personalized learning needs.

The following are example functions that inBloom Index-integrated applications could make using the open inBloom Index APIs (the usage of these capabilities will be based on local priorities and policies):

- Announce usage of resources by an inBloom education organization
- Announce applicability of resources for an inBloom education organization
- Announce the effectiveness of resources
- Announce relationships between state standards and the Common Core
- Announce teacher ratings for content from an inBloom education organization
- Announce updates to content
- Announce LRMI-based tagging of content
- Announce changes to the Common Core

In today's increasingly information-rich world, more than ever educators realize that none of us has all of the answers—but each of us has some of the answers. The Learning Registry is built around leveraging the effects of networking, allowing us to share what we know so that we can all benefit from each other's shared expertise. It offers a powerful sharing tool for publishers and educators alike.



## A Look Ahead

We hope this guide has provided clarity and useful information about the Learning Resource Metadata Initiative (LRMI) and the Learning Registry. The universe of educational resources has grown exponentially over the past several years, as has the capability of technology to search and sort this content. Now, more than ever, users want to quickly and easily find materials to meet their specific educational needs. Together, the LRMI and Learning Registry hold the promise for helping meet these expectations.

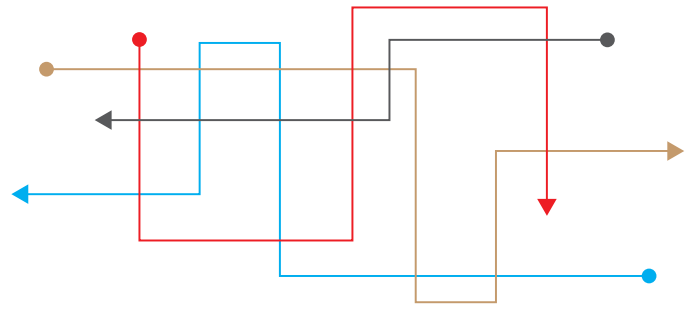
Where do we go from here? The first step involves widespread usage of the LRMI specification among the educational resource community. At the time of this publication, adoption by Schema.org has not been made official. And, as Google Fellow Ramanathan V. Guha indicated at a recent LRMI workshop, even if/when it has, the search engines cannot and will not share any future plans that involve LRMI (or any other Schema.org markup, for that matter). However, Guha did indicate that the number one way to drive the engines to pay attention to LRMI metadata is to use it. Once a critical mass of content has been tagged, it will be in their best interests to use that metadata to improve user experience.

On the other hand, there are several important initiatives that are making use of LRMI metadata right now. The Learning Registry is one. When publishers and content providers load tagged information into widely accessible networks such as the Learning Registry, it becomes available to a multitude of users representing a wide range of organizations and interests. These users provide feedback about the resource (e.g., how it was used, effectiveness, alignment to standards). They feed this usage data (paradata) back into the inBloom Index, where it becomes part of the product description.

Through this process, users gain access to a rich, evolving source of information about both paid and OER materials. While it remains to be seen how application developers make use of this rich data, one might look to the innovative ideas being generated by inBloom's codeathons.

To take full advantage of the opportunities that the LRMI and Learning Registry offer, publishers and content providers must implement the LRMI specification for tagging both existing and new products. For more detailed information on the process of tagging educational content, please refer to ***The Smart Publisher's Guide to LRMI Tagging***.

Over time, as more learning resources are tagged and made available through networks such as the Learning Registry and as more usage data is collected on those resources, users can more easily identify resources to meet learners' specific needs. In this way, the LRMI and the Learning Registry play a key role in helping reach the goal of providing personalized learning for students.



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Steve Nordmark, Knovation

Greg Grossmeier, Creative Commons

Brandt Redd, Bill & Melinda Gates Foundation

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Roger Rosen, Rosen Publishing

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Paula Saarinen, Alvarez and Marsal

Matt Howard, Zaner Bloser

Stuart Sutton, Dublin Core Metadata Initiative

Michael Jay, Educational Systemics

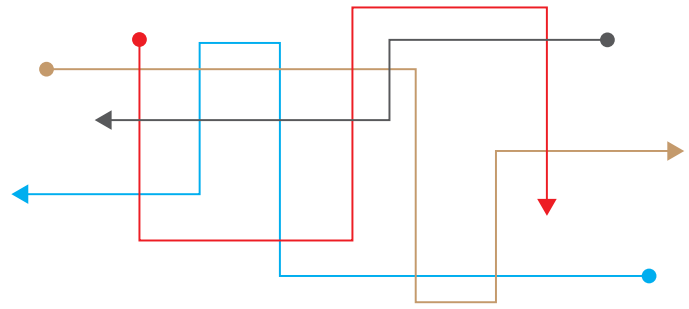
Paul Tearnen, Alvarez and Marsal

Lee Wilson, PCI Education

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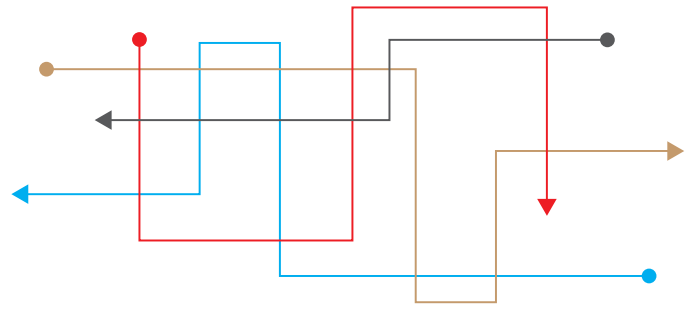


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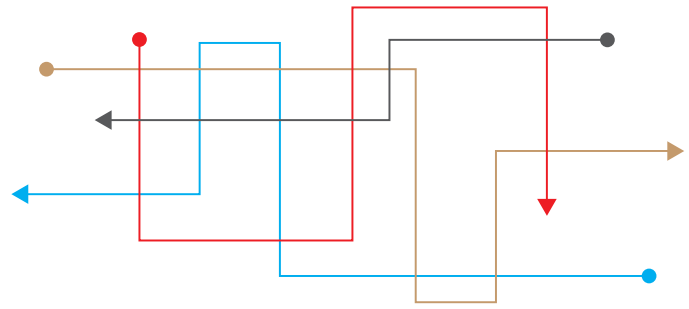
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## Appendix A

### Current Content Contributors to the Learning Registry

ADL 3D Repository	ISKME/OER Commons
Agilix/BrainHoney	JES & Co.
Benetech	JISC
BCOE/CADRE	Library of Congress
BetterLesson	National Archives
California Department of Education	Navigation North
Doing What Works	NSDL
eMediaVA	PBS LearningMedia
European Schoolnet	Shodor
Florida's CPALMS	Smithsonian Education
FREE	



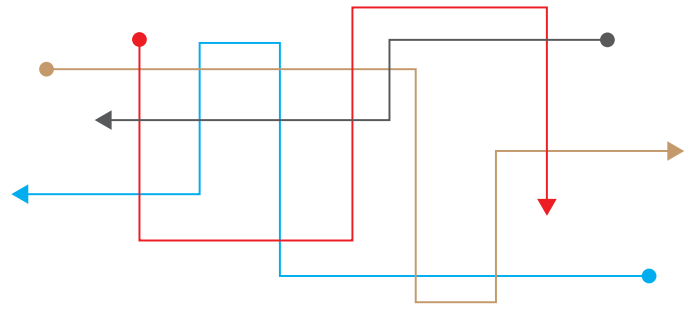
## Appendix B

### LRMI Specification Version 1.1

This representation has been slightly adapted to fit the medium. Please see

<http://www.lrmi.net/the-specification> for the official representation of the LRMI specification.

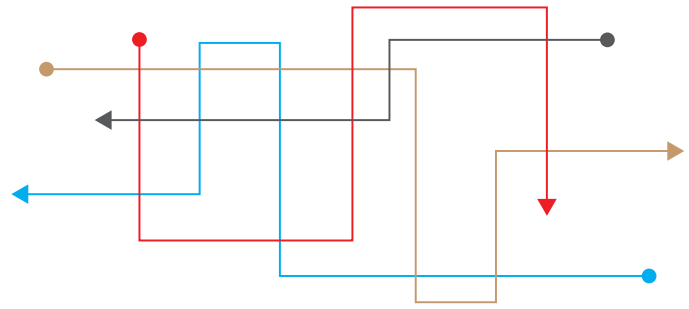
PROPERTY	EXPECTED TYPE	DESCRIPTION
<b>educationalRole</b>	schema.org/Text	The role that describes the target audience of the content. Ex: "student" or "teacher"
<b>educationalAlignment</b>	schema.org/alignmentObject* (see alignmentObject on next page)	An alignment to an established educational framework.
<b>educationalUse</b>	schema.org/Text	The purpose of the work in the context of education. Ex: "assignment" or "group work"
<b>timeRequired</b>	schema.org/Duration (ISO 8601)	Approximate or typical time it takes to work with or through this learning resource for the typical intended audience. Ex: "P30M" or "P1H25M"
<b>typicalAgeRange</b>	schema.org/Text	The typical range of ages of the content's intended end user. Ex: "7-9" or "18-"
<b>interactivityType</b>	schema.org/Text	The predominant mode of learning supported by the learning resource. Ex: "active" or "mixed"
<b>learningResourceType</b>	schema.org/Text	The predominant type or kind characterizing the learning resource. Ex: "presentation" or "handout"
<b>useRightsUrl</b>	schema.org/URL	The URL where the owner specifies permissions for using the resource. Ex: " <a href="http://creativecommons.org/licenses/by/3.0/">http://creativecommons.org/licenses/by/3.0/</a> "
<b>isBasedOnUrl</b>	schema.org/URL	A resource that was used in the creation of this resource. This term can be repeated for multiple sources.



### \* Properties from alignmentObject

AlignmentObject is an intangible item that describes an alignment between a learning resource and a node in an educational framework.

PROPERTY	EXPECTED TYPE	DESCRIPTION
<b>alignmentType</b>	schema.org/Text	A category of alignment between the learning resource and the framework node. Recommended values include: "assesses," "teaches," "requires," "textComplexity," "readingLevel," "educationalSubject," and "educationLevel."
<b>educationalFramework</b>	schema.org/Text	The framework to which the resource being described is aligned.
<b>targetDescription</b>	schema.org/Text	The description of a node in an established educational framework.
<b>targetName</b>	schema.org/Text	The name of a node in an established educational framework.
<b>targetUrl</b>	schema.org/URL	The URL of a node in an established educational framework.



## Appendix C

### Learning Registry Alignment Paradata Example

Full example in the Learning Registry of using LR Paradata 1.0 to align a resource to an academic standard:

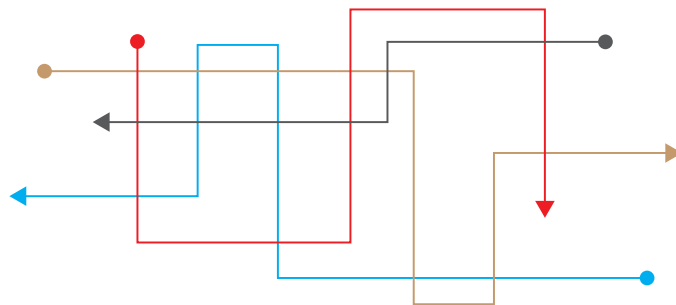
[https://node01.public.learningregistry.net/harvest/getrecord?by\\_doc\\_ID=t&request\\_ID=02ba2b367e8b407f900fed2df0061fb5](https://node01.public.learningregistry.net/harvest/getrecord?by_doc_ID=t&request_ID=02ba2b367e8b407f900fed2df0061fb5)

This example is based on a recipe from the **Paradata Cookbook**, which shows paradata for an educator matching a resource to an academic content standard. Information about the standard, including ASN ID, is included in the related object space. The verb used here was chosen by the Brokers of Expertise portal to indicate based on their own agreed upon levels of alignment: recommended, matched, and aligned. At some point we should consider a system of listing synonyms for verbs, actors, objectTypes, etc.

```
{  "activity": {    "actor": {      "description": [        "9",        "10",        "English Language Arts"      ],      "objectType": "educator"    },    "verb": {      "action": "matched",      "date": "2011-11-07",      "context": {        "id": "http://www.myboe.org/go/resource/7238",        "description": "Brokers of Expertise resource management page",        "objectType": "LMS"      }    },    "object": {      "id": "http://www.readwritethink.org/lessons/lesson_view.asp?id=131",      "related": [        {          "objectType": "academic standard",          "id": "http://purl.org/ASN/resources/S101282A",          "content": "Select a focus when writing."        },        {          "content": "A resource found at http://www.myboe.org/go/resource/7238 was matched to the academic content standard with ID http://purl.org/ASN/resources/S101282A by an educator of multiple grades and English Language Arts on November 7, 2011"        }      ]    }  }
```

### LR Envelope Example

Visit the **Resource Data Description Model (envelope) section of the Learning Registry Technical Specification v0.23.0** to get a sense for the LR envelope requirements.



## Appendix D

### Useful Links

#### Companies and Organizations Mentioned in the Guide

Achievement Standards Network:  
<http://asn.jesandco.org/>

Agilix: [www.agilix.com](http://www.agilix.com)

Association of Educational Publishers:  
[www.aepweb.org](http://www.aepweb.org)

BetterLesson: <http://betterlesson.com>

Bill & Melinda Gates Foundation:  
[www.gatesfoundation.org](http://www.gatesfoundation.org)

BrainPOP: [www.brainpop.com](http://www.brainpop.com)

Brokers of Expertise: [www.myboe.org](http://www.myboe.org)

California Center for Career and Technical  
Education: [www.cteonline.org](http://www.cteonline.org)

Common Core State Standards:  
[www.corestandards.org](http://www.corestandards.org)

Council of Chief State School Officers:  
[www.ccsso.org](http://www.ccsso.org)

Creative Commons: <http://creativecommons.org>

Curriki: [www.curriki.org](http://www.curriki.org)

Dublin Core Metadata Initiative:  
<http://dublincore.org>

Educational Systemics: [www.edusystemics.com](http://www.edusystemics.com)

European Schoolnet: [www.eun.org](http://www.eun.org)

Federal Resources for Educational Excellence:  
<http://free.ed.gov>

IEEE Learning Technologies Standards Committee:  
[www.ieeeeltsc.org](http://www.ieeeeltsc.org)

inBloom: [www.inbloom.org](http://www.inbloom.org)

JES & Co.: [www.jesandco.org](http://www.jesandco.org)

Knovation: [www.knovationlearning.com](http://www.knovationlearning.com)

Learning Registry: [www.learningregistry.org](http://www.learningregistry.org)

Library of Congress: [www.loc.gov](http://www.loc.gov)

National Archives: [www.archives.gov](http://www.archives.gov)

National Governors Association: [www.nga.org](http://www.nga.org)

National Information Standards Organization:  
[www.niso.org](http://www.niso.org)

National Science Digital Library: <http://nsdl.org>

Ohio Resource Center: [www.ohiorc.org](http://www.ohiorc.org)

PBS LearningMedia: [www.pbslearningmedia.org](http://www.pbslearningmedia.org)

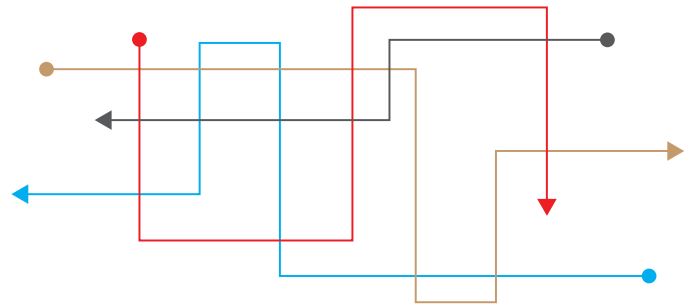
PCI Education: [www.pcieducation.com](http://www.pcieducation.com)

Rosen Publishing: [www.rosenpublishing.com](http://www.rosenpublishing.com)

Schema.org: [www.schema.org](http://www.schema.org)

U.S. Department of Education: [www.ed.gov](http://www.ed.gov)





## Reports Mentioned in the Guide

### From AEP

*LRMI Survey Report: July 2012,*

<http://www.lrmi.net/educators-and-publishers-want-improved-online-search-for-learning-resources>

*Easy Access and Search for Education Summary Report,* [http://www.lrmi.net/?attachment\\_id=2239](http://www.lrmi.net/?attachment_id=2239)

### From Learning Registry

*Building a Network of Resource-Sharing States,*

[https://docs.google.com/file/d/0B\\_uZnuv2HuPWT2pmNnQ0XzIKZk0/edit](https://docs.google.com/file/d/0B_uZnuv2HuPWT2pmNnQ0XzIKZk0/edit)

*Learning Registry in 20 Minutes or Less,*

[https://docs.google.com/document/d/12nvvm5ClvLxSWptlo52rTwIDvobiFylYhWLVpbVcesU/edit?hl=en\\_US](https://docs.google.com/document/d/12nvvm5ClvLxSWptlo52rTwIDvobiFylYhWLVpbVcesU/edit?hl=en_US)

### Presentations/Webinars/Videos

"Education Metadata: Why LRMI Will Change Your Business," presentation at the Frankfurt Book Fair by Michael Jay of Educational Systemics and Jason Henry, Learning Media Ltd., October 2012,

<http://www.lrmi.net/dev/lrmi-at-the-frankfurt-book-fair>

"LRMI Workshop Presentations," January 2013 (multiple speakers and topics),

<http://www.lrmi.net/slides-lrmi-workshop-slc-camp-bay-area>

"Learning Resource Metadata for Schema.org Webinar," organized July 2012 by Phil Barker of JISC/

CETIS, <http://www.slideshare.net/philb/learning-resource-metadata-for-schemaorg>

"What is the LRMI?" (four-minute overview video, June 2012, available on the LRMI website), [www.lrmi.net](http://www.lrmi.net)

### To Learn More

For further useful resources, visit the Resources section of the LRMI website at

[www.lrmi.net/resources/](http://www.lrmi.net/resources/).

*The Smart Publisher's Guide to LRMI Tagging* offers valuable information about metatagging, including a tagging checklist and an example of tagged material.